ON THE DIET AND FEEDING HABITS OF *HEMIDACTYLUS FRENATUS* (DUMÉRIL AND BIBRON) (REPTILIA: GEKKONIDAE) AT RANGOON, BURMA

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SUMMARY.

Twenty-one specimens of *Hemidactylus frenatus* (Duméril and Bibron) were examined at Rangoon, Burma; the stomach contents were listed and observations were made on the feeding habits of several communities. Consideration of these observations and records of geckos ingesting prey normally regarded as aposematic, led to the conclusion that insufficient evidence exists for it to be possible to establish whether *H. frenatus* is a discriminate feeder, although it has been previously believed to be so.

INTRODUCTION

Numerous references to studies of *Hemidactylus* spp. may be found in bibliographies of zoological literature, and *H. frenatus* is probably one of the better known species.

Several papers list food items which were accepted, or examined, but rejected, by the geckos. Of these the most comprehensive is probably that by Sevastopulo (1936) in India, whilst a note by Lamborn (1921) of an observation in Malaya on a species which was possibly *H. frenatus*, is also of interest. More recently Nagtegaal (1954) in a paper describing his successful method of breeding specimens of *H. frenatus* and *H. platyurus* (Schneider) from eggs exported from Indonesia to Holland, mentioned the food items accepted or rejected in captivity.

The present investigation, which is based on observations made at the Young Men's Christian Association, Llanmadaw Branch Hostel at Rangoon, Burma, during the period 13th-28th December, 1958, was carried out to determine the range of prey ingested. Close attention was paid to observations of feeding habits to determine whether this species is a selective feeder.

METHODS

In the majority of cases the specimens were collected by hand but, when not within reach, capture was quite simply effected by means of a large butterfly net.

After the geckos had been killed with carbon tetrachloride vapour, the following data was recorded prior to dissection: the length of the body, including the tail, measured dorsally from the external nares to the extremity of the tail; the length of the body, excluding the tail, measured ventrally from the anterior extremity of the lower jaw to the vent; the tail was examined for the presence of scars revealing previous loss and subsequent regeneration of that appendage. The stomach was then removed and the contents examined and listed.

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HABITAT

During the hours of daylight *H. frenatus* lives in crevices in walls within houses, restaurants, shops, etc., but at an hour or two before dusk the geckos emerge, and at night are to be found congregating near electric lights in search of insects.

In Calcutta geckos were seen clinging to the plate glass windows of shops below neon lights, whilst the outer surface of warehouse walls on the dockside at Surabaja, Java, provided a hunting ground for several hundred specimens.

The specimens examined at Rangoon Y.M.C.A. were captured on the walls of the dormitories, staircase, showers and lavatories, and on the walls of a small cafeteria situated adjacent to the Y.M.C.A.

The status of *H. frenatus* in private dwellings in Burma is a rather unusual one. There is no doubt that its presence is beneficial to the occupants, for the control of household insect pests, a fact noticed also in the Philippines by Taylor (1922). However, since many of these Burmese people are Buddhists, and the beliefs of some of these followers restrain them from harming even an insect, it is probable that geckos would be tolerated in houses even if such a symbiotic relationship did not exist. Furthermore, a widely accepted superstition exists which states that if a person is bitten by a gecko, he or she must immediately drink water for, if the gecko does so before the victim, the victim will die. It is claimed by others that this myth applies only to the Tokay (*Gecko gecko*) but, whatever the origin, there appears to be a distinct reluctance amongst some Burmese to handle these creatures. The bite of both can be most painful and that of the Tokay severe, but it is worthwhile reflecting here that only two species of venomous lizard exist in the world, one in North America and the other in Borneo. The result is that the geckos in Burma are respected, tolerated and therefore permitted to propagate their kind unmolested in the habitations of man.

SIZES OF SPECIMENS CAPTURED

The Gekkonidae are well known for their rapid rate of growth, and Cagle (1946) records one species (*H. garnoti* Duméril and Bibron) completing development in 30-40 days of hatching from the egg. Nagtegaal's captive specimens of *H. frenatus*, however, took considerably longer, and a specimen which measured 35-40 mm. total length when hatched on 31.8.53, had only reached a length of 70 mm. six weeks later. His specimens had been reared in a terrarium at a temperature of 25° C., and it is probable that the optimum temperature, based on that experienced during the season when the eggs are laid, is several degrees higher than this figure.

The histogram in Fig. 1 compiled from the body lengths (measured ventrally from the vent to the snout) of the twenty-one Burmese specimens, reveals a distinct bimodality representing juvenile and adult specimens. In view of the small number of individuals involved, it is not possible to determine here whether the adult specimens (55-70 mm. body length) represent one or more generations.

FEEDING HABITS

The method of approach of *H. frenatus* to an insect is initially a rapid movement followed by one of great stealth, until the gecko is within a few inches of its prey when it makes a sudden rush at the object. The tongue plays little or no part in the capture which is accomplished by a rapid movement of the jaws. The writer's observations support those of Sevastopulo who considered that this last rush is provoked by some slight movement on the part of the prey.

At the Rangoon Y.M.C.A. fierce competition for food items was observed amongst the geckos, well illustrated by the following example. Two mature specimens simultaneously approached the same food item, a dragonfly, and the larger upon noticing that a competitor existed, turned from the prey and attacked the other gecko. Despite the fact that the commotion disturbed the dragonfly, which hurriedly escaped, the larger gecko, which already lacked one eye, grasped the smaller by the lower jaw and clung there for several minutes.

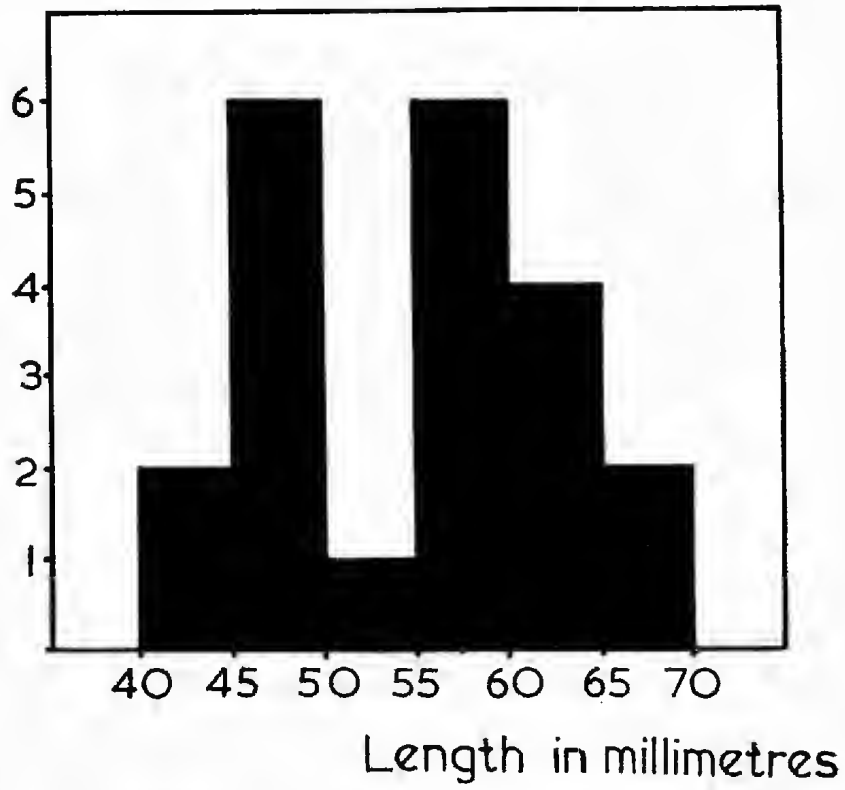

Fig. 1.—Histogram of body lengths of specimens examined. Horizontal scale: body lengths in millimetres; vertical scale: frequency.

Each lizard in turn made violent spasmodic sideways movements with its head, with the result that in a few minutes both were bleeding profusely and at the end their issue remained apparently undecided.

Whether this attack by the larger upon the smaller was, as it appeared, to be induced solely as competition for the same food item or whether a distinct territorialism also exists as a contributory factor could not be determined.

STOMACH CONTENTS

A total of eighty-three food items were recovered from the twenty-one stomachs examined, and is tabulated in the form of a point frequency diagram in Fig. 2. Facilities for the detailed identification of the stomach contents were not available at the time that the observations were made. The food items were therefore only classified to the order, and occasionally to the family.

Three stomachs each contained single specimens of Hymenoptera of which one was an aphid (Family: Aphididae), another an ant (Family: Formicidae), whilst the remaining specimen was in such an advanced state of digestion that identification was impossible. Of eight specimens of Coleoptera recovered from four stomachs, digestion was advanced in seven cases, but the eighth was a member of the Curculionidae Family.

The seventeen Lepidoptera found in a total of eleven stomachs consisted of ten adult microlepidoptera and seven adult macrolepidoptera. Of the latter, the bulk of the food item was frequently large in comparison with the size of

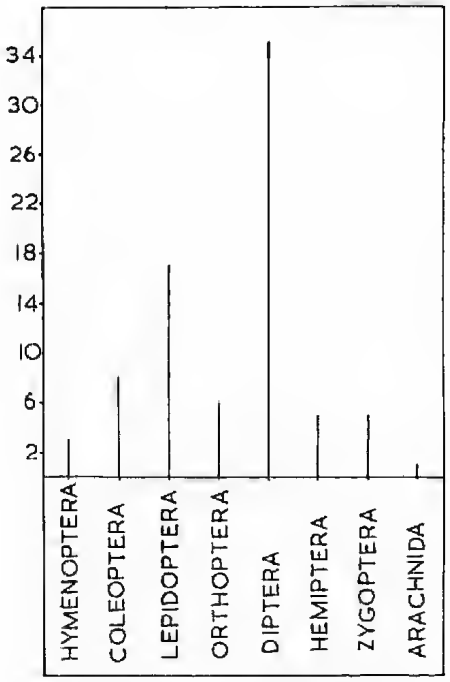

Fig. 2.—Point frequency diagram of stomach contents. Horizontal scale: types of prey; vertical scale: number of specimens recovered from stomachs.

the predator. The wing span measurements of the three largest prey were 33 mm., 28 mm., and 21 mm. from predators with body lengths of 65 mm., 55 mm., and 48 mm. respectively.

Three stomachs each contained two nymph crickets (Orthoptera: Family Gryllidae).

Diptera were the prey most frequently ingested and a total of thirty-five specimens (of which fourteen were mosquitoes, Family Culicidae), were recovered from thirteen stomachs.

The remainder of the food items consisted of five small Hemiptera, one dragonfly: Zygoptera, and five spiders (Arachnida: Family Araneae).

DISCUSSION

As has been revealed by the observational data, the habit of large numbers of geckos to congregate together results in fierce competition between them for any potential food item. It is therefore most interesting to note instances where

none of the geckos in a group would attempt to capture a particular type of insect. Such a case is described in a note by Lamborn (1921), who observed three geckos separately examine a specimen of *Hypsa* (= *Asota*) *alciphron* Cram. which had settled upon the ceiling of a room in his house at Kuala Lumpur. He noted that although geckos captured, or attempted to capture, other species they ignored the *H. alciphron*. Cott (1955) concluded that this was an example of selective feeding but, since Lamborn stated that the moth did not move at all during the period that it was examined by the geckos, and thus did not provoke attack as was found to be necessary by Sevastopulo and the writer, it would not appear to be quite as convincing an example as Cott believed.

A much better example of geckos avoiding a type of prey is that mentioned by Sevastopulo, who observed geckos approaching the bee, *Apis mellifera indica*, and then retreating from it. Since the bee would be regarded as distinctly aposematic this reaction is perfectly normal if the predator is a discriminate feeder. It is therefore indeed quite remarkable when the same author found that the brilliantly coloured larva of *Paraspa lepida* Cr., which, covered with urticating bristles, must be considered distinctly aposematic although procryptic in its natural surroundings, was devoured by the geckos promptly.

The present Burmese data reveal that a wide variety of prey is ingested in the probable proportion in which they occurred in the hostel. Mosquitoes and other Diptera were undoubtedly the insects most frequently occurring there, and it is therefore not surprising that these insects were found with equal frequency in the stomachs examined. None of the items could be regarded as aposematic.

Since many of the prey are to be regarded as household pests, it is established that the presence of *H. frenatus* is beneficial to the occupants.

Although examples of feeding which are clearly selective do occur, the converse cases are just as frequently recorded, and it is therefore concluded that there is insufficient evidence to date to assume that *H. frenatus* is a discriminate feeder, if discrimination of prey is determined by the visual senses.

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